REMARKS

Claims 1-10, 12-13 and 16-17 were pending. By way of the present Reply, claims 12-13 are amended to incorporate the Examiner's suggestions. No claims are added or cancelled. Claims 1-10, 12-13 and 16-17 remain pending and are submitted for reconsideration.

Rejections under 35 U.S.C. § 103 – Neerinck and Moronuki

Claims 1-10 and 12-15 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,228,471 ("Neerinck") in view of U.S. Patent No. 6,821,497 ("Moronuki"). Applicants cancelled claims 14-15 in the Amendment and Reply filed December 1, 2010. Thus, the rejection of claims 14-15 is moot.

Neerinck in view of Moronuki fails to disclose, teach or suggest each and every claim recitation.

Claims 1 and 13 are independent claims.

Claim 1 is directed to a layered structure that comprises, among other things, (A) "a first intermediate layer, said first intermediate layer consisting of a titanium based coating of at least one of Ti, TiC, TiN, and TiCN," (B) "a second intermediate layer deposited on top of said first intermediate layer, said second intermediate layer comprising a diamond-like nanocomposite composition" and (C) "a diamond-like carbon layer deposited on top of said second intermediate layer." Claim 13 is directed to a layered structure that includes similar elements to those of claim 1. The claimed structure provides a layered structure that has superior properties with respect to dynamic behavior and lifetime of the layered structure in for example high shear and high loading applications.

The Office Action relies on Neerinck and Moronuki to disclose the claimed layered structure (Office Action dated June 2, 2010 at p. 2 and Office Action dated January 13, 2010 at p. 2). The Office Action contends that "Neerinck discloses a layered structure wherein alternating layers of DLN and DLC are deposited on a substrate" and that "Moronuki discloses usage of a metal bridge layer such as titanium or chromium...between a substrate and DLN" (Office Action dated June 2, 2010 at p. 2 and Office Action dated January 13,

2010 at p. 2). Based on a subsequent conversation with the Office, it is Applicants' understanding that the Office intended to state in the Office Actions dated June 2 and January 13, 2010 that Moronuki disclosed usage of a metal bridge layer such as titanium or chromium between a substrate and DLC and not usage of a metal bridge layer such as titanium or chromium between a substrate and DLN. Applicants agree with the Office's assessment that Moronuki does not disclose usage of a metal bridge layer such as titanium or chromium between a substrate and DLN (the attached declaration of Marc Sercu at ¶ 5, to be disclosed below).

One of ordinary skill in the art at the time of invention, however, would not have combined Neerinck with Moronuki. Neerinck discloses that "[d]oping DLC with both metals (Ti, Zr, W, Nb, Ta) and non-metallic elements (Si, F, O, B, N) favourably influences many properties but generally lowers the hardness" and that, therefore, one goal of the invention of Neerinck is to improve sensibility to compressive stresses (Neerinck at col. 1, line 30 – col. 2, line 2). In contrast, Moronuki discloses that "[i]t has been proposed to enhance the adhesion of the amorphous hard carbon film to the substrate by means of sandwiching between the substrate and the film an intermediate layer consisting of metal, metal nitride and metal carbide" (Moronuki at col. 2, lines 13-17). Consequently, Neerinck discloses not doping metals, such as Ti, with DLC while Moronuki discloses doping DLC with metals. In fact, Neerinck goes so far as to disclose that "instead of using Si or a metal bridge layer between a DLC-layer and the substrate (according to the state of the art), the application of DLN-layers in the stack which alternate with DLC-layers provides a reasonably hard and wear resistant coating" (Neerinck at col. 3, lines 29-34). Combining Moronuki with Neerinck by adding the metal of Moronuki to the DLN + DLC of Neerinck would prevent Neerinck from accomplishing its purpose of improving sensibility to compressive stress by lowering hardness. As such, one of ordinary skill in the art at the time of invention would not have modified Neerinck with Moronuki.

Moreover, as evidenced by the accompanying Declaration Under 37 C.F.R. § 1.132 of Marc Sercu ("Sercu Decl."), the claimed invention produces unexpected results and has commercial success.

To show unexpected results, Applicants "must compare the claimed subject matter with the closest prior art" and the evidence relied upon must establish "that the differences in results are in fact unexpected and unobvious and of both statistical and practical significance" (M.P.E.P. §§ 716.02(b), (e)). As attested to by Mr. Sercu, an expert in the field, "Neerinck discloses a diamond-like nanocomposite ("DLN") and diamond-like carbon coating ("DLC")" and "was and remains the closest art" (Sercu Decl. at ¶¶ 3 and 5). During a telecconference with Applicants' agent, the Office identified Neerinck as the closest prior art.

In comparing the invention to Neerinck, Applicants "performed experiments on can tooling, bending tools, reverse aluminum extrusion and door latches for a titanium based coating + DLN + DLC coating, a DLN + DLC" (Sercu Decl. at ¶ 7). "The experimental results showed that the high shear and high loading properties of the layered structure of the claimed invention, for example titanium + DLN + DLC, were superior to the high shear and high loading properties of the DLN + DLC" (Sercu Decl. at ¶ 8). For example, "for can tooling, the experimental results showed that an uncoated tool ran merely 10 weeks, DLN + DLC ran 25 weeks and the layered structure of the claimed invention ran 90 weeks," "[f]or bending tools, the experimental results showed that the DLN + DLC lasted for 5 days while the layered structure of the claimed invention lasted 35 days," "[f]or reverse aluminum extrusion, the experimental results showed that DLN + DLC had an average life of 500 cycles while the layered structure of the claimed invention had an average life of 5000 cycles" and "[f]or door latching, the experimental results showed that DLN + DLC could not withstand the shear forces applied while the layered structure of the claimed invention could withstand the shear forces applied without deforming" (Sercu Decl. at ¶ 8). The overall experimental results, therefore, "show that the layered structure of the claimed layered structure performed up to 10 times as well, in high shear and high load applications, as DLN + DLC" (Sercu Decl. at ¶ 9).

One of ordinary skill in the art at the time of invention would not have thought that adding a titanium based coating to DLN + DLC would perform well in high shear and high loading applications. In fact, the declarant states that "a person of skill in the art would not have expected that making such a combination would provide a layered structure having such

an impact on the dynamic behavior and lifetime of the layered structure in high shear and high loading applications as compared to that of DLN + DLC" (Sercu Decl. at ¶ 9).

To show unexpected results, Applicants' unexpected results must be "commensurate in scope with the claims which the [unexpected results] evidence is offered to support" (M.P.E.P. § 716.02(d)). The Office asserts that Applicants "instant claims are broader than a mere disclosure of titanium + DLN + DLC [and that for] these results to be considered unexpected...Applicants will need to amend the instant claims as such to reflect those which they have proper unexpected results for" (Office Action dated June 2, 2010). Claims 1 and 13 recite that all of the claimed coatings for the first intermediate layer are titanium based. Moreover, dependent claim 2 recites that the "first intermediate layer consists of titanium" and dependent claim 17 recites that the "layered structure is configured for use in a high impact and/or high shear application" As such, the claims are commensurate in scope with the unexpected results.

The Office and Advisory Actions incorrectly request that Applicants compare the claimed invention to the combination of Neerinck and Moronuki to show unexpected results by asserting that "Applicants are requested to hereby show that their structure of Ti + DLN + DLC would have a result superior and unexpected to that of the combination of Neerinck and Moronuki" and "the Applicants seem to be attacking both of the references individually and not in combination of them in this attempt to show an unexpected result" (Advisory Action dated September 9, 2010 and Office Action dated June 2, 2010). Applicants need only compare the claimed invention with the closest prior art, but Applicants are not required to compare the claimed invention with what is allegedly suggested by a combination of references relied upon to reject the claims under 35 U.S.C. § 103. In fact, forcing Applicants to compare the claimed invention with what is allegedly suggested by a combination of references "would be requiring comparison of the results of the invention with the results of the invention" (M.P.E.P. § 716.02(e)(III)). In other words, Applicants are not required to attack Neerinck and Moronuki in combination to show an unexpected result. Instead, Applicants are merely required to compare the claimed invention with the closest prior art. As previously provided, Applicants did just that; Applicants compared titanium +DLN + DLC to DLN + DLC.

To show commercial success, "the evidence of nonobviousness including commercial success must be commensurate in scope with the claims" (M.P.E.P. § 716.03(a)(I)). Claims 1 and 13 require a first layer consisting of or consisting essentially of a titanium based coating, a second layer comprising a diamond-like nanocomposite composition and a third layer comprising a diamond-like carbon layer. Customers informed the declarant that they "bought titanium + DLN + DLC as compared to DLN + DLC...because of its superior properties such as in high shear and high load applications" (Sercu Decl. at ¶ 11). Moreover, sales figures show that the commercial success is in scope with the claims. Specifically, "[t]he increased amount of batches for titanium + DLN + DLC and the decreased amount of batches for DLN + DLC show that customers bought the titanium + DLN + DLC at an increased rate and bought the DLN + DLC at a decreased rate from 2003 to 2010" (Sercu Decl. at ¶ 11). As customers explicitly indicated that they bought titanium + DLN + DLC over DLN + DLC and sales figures show that significantly more batches of titanium + DLN + DLC were sold over an eight year span than batches of DLN + DLC, the layered structure of claims 1 and 13 is commercially successful.

For at least the aforementioned reasons, the rejection of claims 1 and 13 over Neerinck in view of Moronuki should be withdrawn. Claims 2-10 and 12 depend from claim 1 and are allowable, therewith, for at least the reasons that claim 1 is allowable in addition to their respective recitations.

Independent 16 includes similar elements to claims 1 and 13 and is likewise allowable.

CONCLUSION

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application, as amended, is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by the credit card payment instructions in EFS-Web being incorrect or absent, resulting in a rejected or incorrect credit card transaction, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

Date 6/15/2011 By _____

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N THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Chandra VENKATRAMAN et al.
Title:	A LAYERED STRUCTURE
Appl. No.:	10/581,188
International Filing Date:	11/30/2004
371(c) Date:	10/4/2007
Examiner:	Richard M. Rump
Art Unit:	1793
Confirmation Number:	3239

DECLARATION OF MARC SERCU UNDER 37 C.F.R. § 1.132

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Marc Sercu, state and declare that:

1. I am a Technology Manager and am employed by Sulzer DLC Coatings NV, a company that has an ownership interest in this application.

2. I received my bachelor's degree in electronics in 1994. I have been working in the field of layered structures since 1996, specializing in Dylyn- and DLC-coatings. A copy of my curriculum vitae is attached to this declaration.

3. By virtue of the experience summarized above and detailed in the attached curriculum vitae, I am aware that, at the time of this invention, U.S. Patent No. 6,228,471 ("Neerinck") and U.S. Patent No. 6,821,497 ("Moronuki") illustrated the state of the relevant art and Neerinck was and remains the closest art.

4. I have read and understand Neerinck, Moronuki and the captioned application. I have also read and believe that I understand the Office Actions dated January 13, 2010 and June 2, 2010.

5. Neerinck discloses a diamond-like nanocomposite ("DLN") and diamond-like carbon coating ("DLC") layered structure (Neerinck at col. 4, lines 28-65). The background of the invention section of Moronuki discloses "enhanc[ing] the adhesion of the amorphous hard carbon film to the substrate by means of sandwiching between the substrate and the film an intermediate layer consisting of metal, metal nitride and metal carbide" (Moronuki at col. 2, lines 13-17). Consequently, Moronuki discloses adding a metal between a substrate and DLC and does not disclose adding a metal between a substrate and DLN.

6. Claim 1 of this application is directed to "[a] layered structure." Pursuant to claim 1, the layered structure comprises "a first intermediate layer, said first intermediate layer consisting of a titanium based coating of at least one of Ti, TiC, TiN, and TiCN," "a second intermediate layer deposited on top of said first intermediate layer, said second intermediate layer comprising a diamond-like nanocomposite composition" and "a diamond-like carbon layer deposited on top of said second intermediate layer." Claims 13 and 16 of this application are also directed to a layered structure. In claim 13, the layered structure comprises "a first intermediate layer, said first intermediate layer consisting essentially of a titanium based coating of at least one of Ti, TiC, TiN, and TiCN," "a second intermediate layer deposited on top of said first intermediate layer, said second intermediate layer comprising a diamond-like nanocomposite composition" and "a diamond-like carbon layer deposited on top of said second intermediate layer." In claim 16, the layered structure comprises "a first intermediate layer consisting of a titanium based coating," "a second intermediate layer deposited on top of said first intermediate layer, said second intermediate layer comprising a diamond-like nanocomposite composition" and "a diamond-like carbon layer deposited on top of said second intermediate layer." Thus, claims 1, 13 and 16 are directed to a layered structure that comprises a titanium based coating, a DLN and a

DLC. In claim 2, the first intermediate layer consists of titanium. In claim 17, the layered structure is "configured for use in a high impact and/or high shear application."

7. I performed experiments on can tooling, bending tools, reverse aluminum extrusion and door latches for a titanium based coating + DLN + DLC coating, a DLN + DLC coating and a metal + DLC coating where the aforementioned coatings correspond to the claimed layered structure of this application, the layered structure of Neerinck and the layered structure of Moronuki, respectively. In all of the above stated cases we were able to compare titanium + DLN + DLC to DLN + DLC. While we did not obtain numerical data that compared Ti + DLC to titanium + DLN + DLC, Ti + DLC was tested next to titanium + DLN + DLC and was shown to be inferior to titanium + DLN + DLC. Please see the attached enclosure for more information on the can tooling, bending tools and reverse aluminum extrusion experiments.

8. The experimental results showed that the high shear and high loading properties of the layered structure of the claimed invention, for example titanium + DLN + DLC, were superior to the high shear and high loading properties of the DLN + DLC. Specifically, for can tooling, the experimental results showed that an uncoated tool ran merely 10 weeks, DLN + DLC ran 25 weeks and the layered structure of the claimed invention ran 90 weeks. For bending tools, the experimental results showed that the DLN + DLC lasted for 5 days while the layered structure of the claimed invention lasted 35 days. For reverse aluminum extrusion, the experimental results showed that DLN + DLC had an average life of 500 cycles while the layered structure of the claimed invention had an average life of 5000 cycles. For door latching, the experimental results showed that DLN + DLC could not withstand the shear forces applied while the layered structure of the claimed invention could withstand the shear forces applied without deforming. Additional experimental results showed that the layered structure of the claimed invention could withstand high shear and high loading for punching, deep draw rings and forming die can tooling, locking pins of blow

molding machines, finger followers in engines and docking systems while DLN + DLC could not.

9. Based on my experience, the aforementioned experimental results of the claimed layered structure were unexpected. Specifically, the experimental results show that the layered structure of the claimed layered structure performed up to 10 times as well, in high shear and high load applications, as DLN + DLC. Based on my professional experience, a person of skill in the art at the time of invention would not have expected that combining metal with DLN + DLC would result in addressing the problems solved by the present invention. For example, a person of skill in the art would not have expected that making such a combination would provide a layered structure having such an impact on the dynamic behavior and lifetime of the layered structure in high shear and high loading applications as compared to that of DLN + DLC because Ti was added to improve adhesion and adhesion was not a limiting factor for the lifetime of a coating.

10. The layered structure of the claimed invention, for example titanium + DLN + DLC, is more commercially successful than DLN + DLC. The amount of batches made for titanium + DLN + DLC versus that of DLN + DLC are shown in the below chart.

	2003	2004	2005	2006	2007	2008	2009	2010
Amherst, USA								
# of runs w/ Ti	199	397	480	727	1117	1300	1507	1821
# of runs w/o Ti	473	377	413	468	108	219	76	18
Total runs	672	774	893	1195	1225	1519	1583	1839
Percentage runs w/ Ti	30%	51%	54%	61%	91%	86%	95%	99%
Zulte, Belgium								
# of runs w/ Ti						478	770	1232
# of runs w/o Ti						1079	637	576
Total runs						1557	1407	1808
Percentage of runs w/ Ti						31%	55%	68%
Herford, Germany								
# of runs w/ Ti						1630	1643	1684
# of runs w/o Ti						127	217	380
Total runs						1757	1860	2064
Percentage runs w/ Ti						93%	88%	82%

11. As shown in the above chart, the overall batches around the world for titanium + DLN + DLC increased from 2003 to 2010 while the overall batches around the world for DLN + DLC decreased from 2003 to 2010. Specifically, the overall batches in the U.S. for titanium + DLN + DLC increased from 199 to 1821 and from 2003 to 2010 the overall batches in the U.S. for DLN + DLC decreased from 473 to 18 from 2003 to 2010. Similarly, the overall batches in the U.S., Belgium and Germany for titanium + DLN + DLC increased from 3408 to 4737 from 2008 to 2010 and the overall batches in the U.S., Belgium and Germany for DLN + DLC decreased from 1425 to 974 from 2008 to 2010. The increased amount of batches for titanium + DLN + DLC and the decreased amount of batches for DLN + DLC show that customers bought the titanium + DLN + DLC at an increased rate and bought the DLN + DLC at a decreased rate from 2003 to 2010. In fact, customers that bought titanium + DLN + DLC as compared to DLN + DLC told me that they bought titanium + DLN + DLC because of its superior properties such as in high shear and high load applications.

12. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date 14th of June 2011 By _____
Marc Sercu

Curriculum Vitae

Personal information

First name(s) / Surname(s)	**SERCU Marc**
Address(es)	J. Lamotestraat 34 bus 2 8800 Roeselare Belgium
Nationality	Belgian

Current occupation

Technology Manager

Work experience

Dates	January 2009 onwards
Occupation or position held	Technology Manager
Main activities and responsibilities	Define long & mid term strategy for R&D DLC Deploy the strategy over the worldwide teams Manage worldwide application development
Name and address of employer	Bekaert Advanced Coatings, Karreweg 13, 9870 Zulte, Belgium Since July 2010 changed into Sulzer DLC Coatings N.V., same address
Type of business or sector	Surface Treatment Services

Dates	February 2004 – December 2008
Occupation or position held	Process Engineer
Main activities and responsibilities	Manage and execute worldwide coating process validation Manage key account applicaton development Offer technical expertise to the DLC production plants
Name and address of employer	Bekaert Advanced Coatings, Karreweg 13, 9870 Zulte, Belgium
Type of business or sector	Surface Treatment Services

Dates	June 1998 – January 2004
Occupation or position held	Project Technician
Main activities and responsibilities	Execute startup and validation of Dylyn®/DLC production machines worldwide (Belgium, Germany, France, USA, Singapore, China) Execute incremental development of Dylyn®/DLC technology Execute application development projects for the market
Name and address of employer	Bekaert Dymonics, Karreweg 13, 9870 Zulte, Belgium
Type of business or sector	Surface Treatment Services

Dates	March 1996 – May 1998
Occupation or position held	Project Technician
Main activities and responsibilities	Execute fundamental development of Dylyn®/DLC technology Execute & evaluate development tests on Dylyn®/DLC Execute first application development for the market Upgrade R&D machine to production state Determine, implement and evaluate design changes Implement automation
Name and address of employer	Bekaert Technology Centre, Oude Heerweg 5, 8540 Deerlijk, Belgium
Type of business or sector	Metal industry - Research & Development

Dates	September 1994 - February 1996
Occupation or position held	Blue collar
Name and address of employer	Roularta, Meiboomlaan, 8800 Roeselare, Belgium
Type of business or sector	Printing industry - Production

Education and training

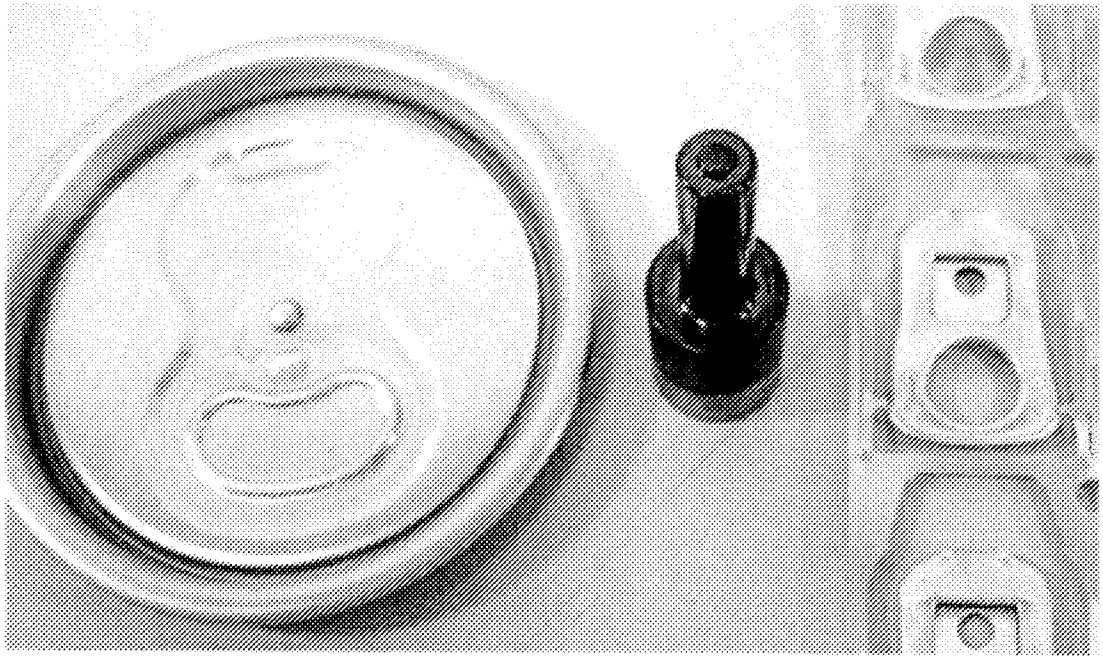
Dates	1989-1994
Title of qualification awarded	Professional Bachelor Electronics
Name and type of organisation providing education and training	KHBO, Ostend, Belgium

Dates	1986-1989
Title of qualification awarded	Scientific A
Name and type of organisation providing education and training	Institute OLV van Vreugde, Roeselare, Belgium

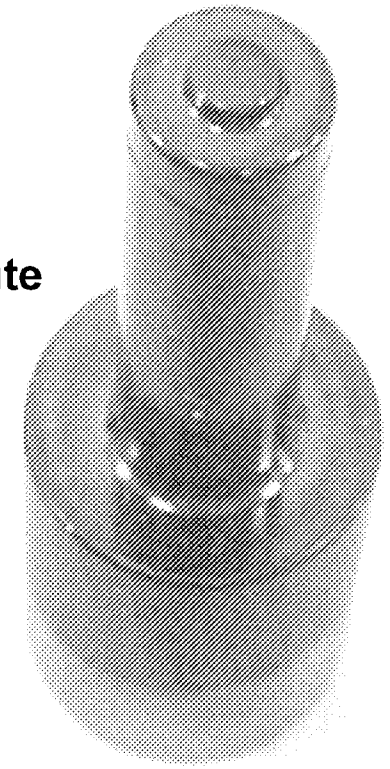
Personal skills and competences

Mother tongue(s)	Dutch
Other language(s)	English, French, German

Can Tooling Staking Application



Riveting Tool



Operation: Staking station running at 600 stokes per minute

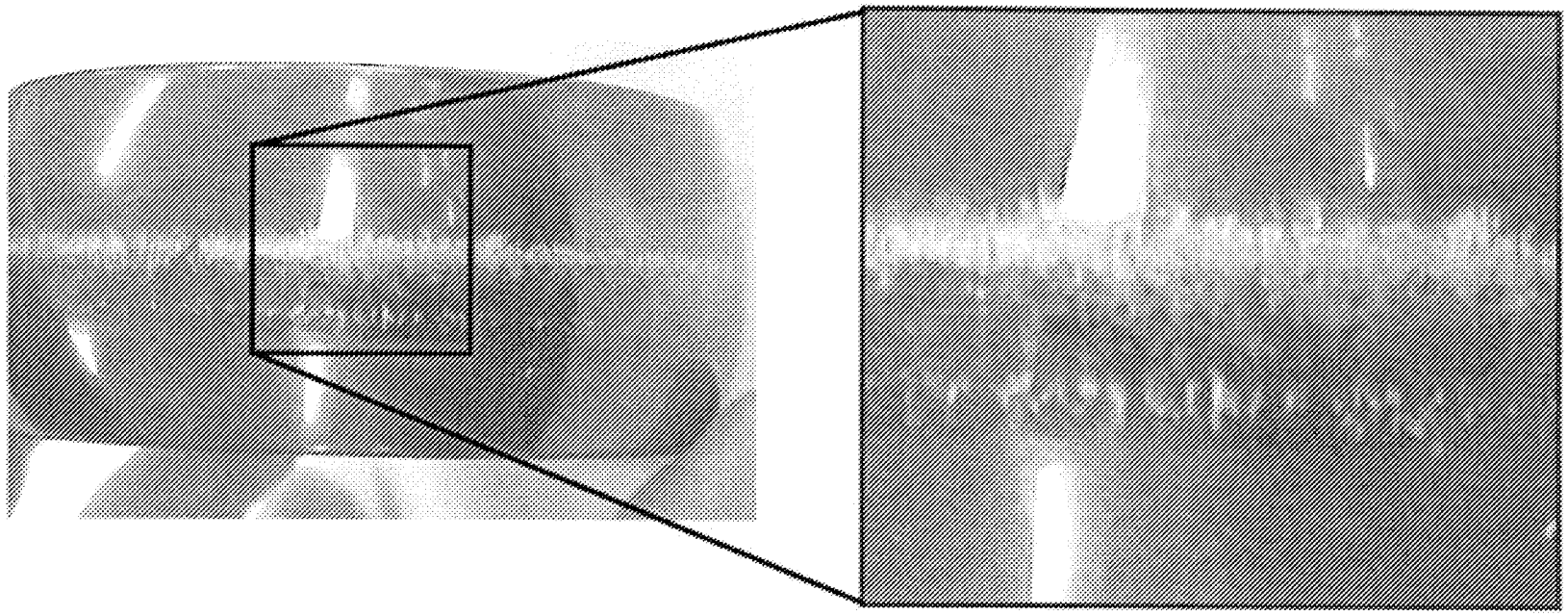
Tool: D-2 Steel Rivet Punch

Part Material: Aluminum

Results:

- Uncoated tool ran 10 weeks
- TiN Coated Tool ran 20 weeks
- DLN/DLC coated tool ran 25 weeks
- DLC-A coated tool ran 90 weeks

Bending Tools – Example of Typical DLC Wear



Part Running: 12 shifts/6 days.

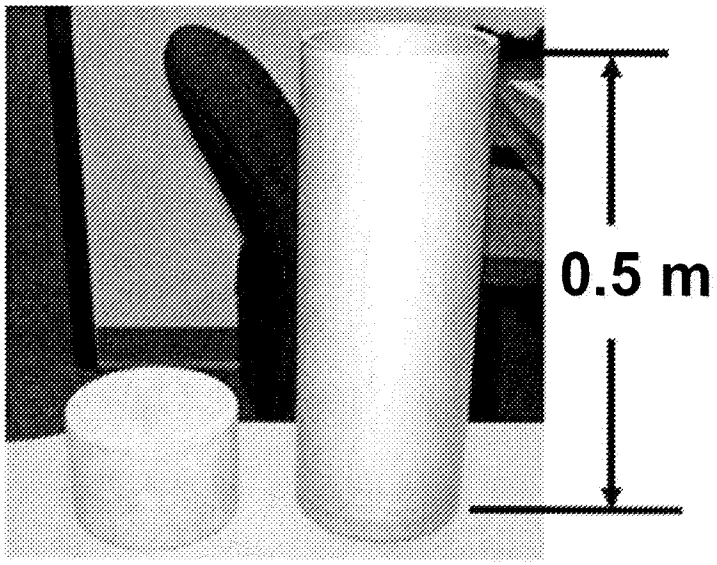
Coolant: water-soluble synthetic coolant

Initial Results: The tool coated with DLN/DLC was examined each morning and only some slight scratches were seen but no build up after the first four days. On the 5th day some build up occurred. (See picture)

Current Results: By changing to DLC A (Ti/DLN/DLC) coating lifetime went from 5 days to 35 days

Good Metal Forming Application – Reverse Aluminum Extrusion

- Customer manufactures aluminum cylinders for medical and automotive applications.
- They use an aluminum billet that is covered with a seriate soap and force a punch end into the billet to reverse extrude the cylinder walls.



- This customer cannot produce one of the longer cylinders without DLC
- Average life using DLN/DLC was 500 cycles
- Average life using Ti/DLN/DLC was 5,000 cycles